

THE ELEMENTAL COMPOSITION OF SHALE OILS. J. P. Fox. Energy and Environment Division, Lawrence Berkeley Laboratory, University of California, Berkeley, CA 94720.

The abundance of 47 elements were measured in 12 shale oils from LETC's controlled-state retort, 7 shale oils from LLL's 125-kg simulated in-situ retort and in oils from the Geokinetics, Occidental, Equity and Paraho processes using neutron activation analysis, x-ray fluorescence spectrometry and Zeeman atomic absorption spectroscopy. The elements studied include C, H, N, As, Se, Co, Ni, Fe, Mn, Zn, U, Cl, Na and others. The resulting data were analyzed to determine the effect of retort operating conditions on measured elemental abundances.

This paper compares the elemental abundances in oils from simulated, surface and in situ processes in the framework of retort operating conditions and discusses the potential environmental implications of observed trace element patterns. This investigation indicates that the major elements in shale oils (>10 ppm) are C, H, N, S, Fe, As, Cl and Na. The elements Al, Ba, Co, Cr, Cu, Hg, Mg, Mn, Mo, Ni, Se, V and Zn occur at concentrations of from 0.1 ppm to less than 10 ppm. All other elements studied occurred at less than 0.1 ppm in most oils. Striking differences were observed between the elemental abundances of Antrim, Moroccan and Green River shale oils.